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Slow down, don't burn too fast... Got to make that old-growth last

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ABSTRACT: REMAINING OLD-GROWTH LONGLEAF PINE ACREAGE (1996): 3902 ha (9755 ac)!!! Longleaf pine forests have been termed critically endangered, with less than three percent of its former area remaining. The remaining forest exists in a variety of conditions, ranging from pristine to highly degraded. For the degraded stands, ecological restoration has been employed to improve the structure and function of these forests. Methods of ecological restoration in longleaf pine forests have included a mixture of reintroducing fire, harvesting of hardwoods, thinning overstocked stands, planting of trees and herbs, and applying herbicides. Federal and state agencies, university researchers, forest industry, and conservation organizations are becoming more active in longleaf pine ecosystem restoration. While many experiments in restoring longleaf can be thought of as successes, mistakes need to be minimized. Restoration efforts have been underway in the Flomaton Natural Area since 1995. Some of the worries of this effort will be presented. We will present examples of problems encountered in the restoration process. By learning from other efforts, we can improve the remaining acreage of longleaf forest, thereby restoring the diverse flora and fauna of this magnificent ecosystem.

INTRODUCTION

Fourteen stands of old-growth longleaf pine forest are thought to exist (Means 1996). These remnants have been reduced to isolated, often degraded patches in the contemporary southeastern landscape. Efforts to restore the degraded stands have revolved around the re-introduction of the dominant force in longleaf pine ecosystems – fire. The problems associated with this methodology have destroyed or further degraded several remnant stands. Fire-suppressed old-growth longleaf pine stands accumulate large quantities of pine litter around tree bases. Reintroduction of fire can consume this layer and often girdle the standing trees. This then results in much of the longleaf pine overstory dying, while the understory of hardwoods resprouts, soon dominating the stand. With the loss of the longleaf overstory and seed source, extensive, and potentially expensive, restoration efforts are required to bring back longleaf pine. With only 9755 acres of old-growth longleaf pine remaining, great care must be taken to avoid these catastrophes.

Restoration efforts have been underway since 1995 in the Flomaton Natural Area. It is a 60-acre old-growth longleaf pine stand located in Flomaton, AL. The stand, owned by Champion International Corporation, had undergone 40+ years of fire suppression. Fire was re-introduced in 1995 and the stand was burned again in 1996 and 1997. Using the Flomaton Natural Area as a basis, we discuss concerns of using fire in old-growth longleaf pine stands.

"Let it burn, it won't hurt anything"

These were the words used to describe a small fire that occurred on the northeast side of the Flomaton Natural Area in May 1993. The fire killed 91% of the old-growth longleaf pine greater than 15 inches diameter at breast height (DBH). One of those trees had a 36" DBH and was 340 years old. The fire had little impact on the hardwoods that were in the stand.

What happened?

How does a small ground-fire kill what is suppose to be one of the most fire-adapted species on the planet? Pine needle litter depth at the bases of trees was substantial, dangerous, and potentially lethal. The aspect of danger associated with pine litter occurs when 1) heavy amounts accumulate under large trees and 2) feeder roots invade this rich organic layer. Prior to the re-introduction of fire in 1995, the average litter depth was 7.2 inches and averaged 9.1 inches for trees greater than 15 inches DBH.

The lethal nature of heavy litter accumulations appears when a fire either kills a large portion of the feeder roots that have developed in the organic layer or the basal litter burns, girdling the tree. The largest trees were girdled at their bases from the heat generated by the burning litter. The trees at the FNA were girdled due to heat residence time in the organic litter around tree bases. The fire was not hot enough to consume much of the litter away from the tree.

The fire free interval allowed the unnatural accumulation of fuels, especially around tree bases. After a prolonged period without fire, a duff layer can form. This duff layer becomes an area where feeder roots can colonize the base of, due to the nutrient exchange occurring there. A fire that completely consumes this duff layer can kill the feeder roots, likely resulting in the death of older trees, due to their reduced ability to grow new roots quickly.

CONCERNS WITH FIRE

Problems encountered in the Flomaton Natural Area:

1. **Draped fuel** was one of the major concerns with the return of fire to the stand after a 40+ year absence. These fuel conditions necessitate cool fires.

2. **Slow movement of the fire through the dense stand** resulted in spotty burning in the stand and the buildup of heat around the base of larger, older trees.

3. **Residence time of heat around the bases of the large, older trees.** Each of the fires in Flomaton have required extensive mop-up due to the heat build-up in the organic layer around the bases of these trees. Though the fire had extinguished several hours earlier and there were no signs of smoke, enough heat had built up in the litter layer to burn crewmembers' hands hours later. Crewmembers carried water bags for hours, and at times, a day after the fire was extinguished. Water from these bags was applied to tree bases until the surrounding area was thoroughly soaked.

4. **Snags continuing to burn** have been a threat in each successive fire in Flomaton. While retention of snags is important, the liability to the stand is much more critical. Snags ignite and then burn for hours or days after the fire has extinguished. When the entire snag or large branches fall to the forest floor, they can reignite the litter layers. This type of fire can go unnoticed for days and destroy the remnant stand.

ALTERNATIVES TO BE CONSIDERED

Potential alternatives/supplements to fire that should be considered in the restoration of old-growth longleaf pine stands include:

1. **Mechanical removal of hardwoods-** Once hardwoods reach 3-4 inches DBH they will be little affected by the cooler burns which should be used for the first few fires in old-growth stands. We realized early on that fire alone would never remove all of the hardwoods. A fuelwood operation was implemented in the Flomaton Natural Area due to the size and density of hardwoods.

2. **Use of herbicides-** If the overstory is too sparse to provide enough fuel to burn, a one-time application of herbicide may be enough to reduce the hardwood competition, provide fuel for a burn, or release natural or planted seedlings.

GUIDELINES FOR RESTORING FIRE SUPPRESSED STANDS

1. **Protect Pine Overstory-** Any restoration effort must emphasize the retention of the overstory and the valuable needle litter it provides as fuel. Pine needle litter carries fire to kill hardwoods, encourage herbaceous plant establishment, and expose soil for longleaf pine seedling germination. If hardwoods are to be harvested, operators must be supervised carefully to avoid damage (basal wounds, soil compaction, etc...) to the residual stand. During and after prescribed fires, water must be applied to bases of residual trees. If we fail to follow either of these recommendations, then we open stands to hardwood sprouting, spread of invasive species, and invite costly corrective measures. *The fact is, without longleaf pine, you can have no longleaf pine ecosystem.*

2. **Evaluate Hardwoods Early-** Hardwood litter deters fire, longleaf seedling germination, and herbaceous plant establishment. Carefully harvesting all stems that will not be killed by fire can accelerate restoration of the residual stand. However, if pine basal area is too low, vigorous hardwood sprouting may negate any harvest impacts. Evaluation of the composition (vigorous vs. poor sprouts), and structure (large trees vs. understory components) of hardwoods can forestall problems in stand restoration.

3. **Catch and Protect Seed Crops-** Filling canopy gaps and maintaining a diversity of age and size classes can serve as insurance against hardwood and non-native invasions. For example, if a gap is colonized by nearby hardwood or non-native remnants, then this area will have to be harvested. This harvest would have to wait until a seed crop was available or seedlings planted. Either of these alternatives will require time, effort, and expense.

4. **Use Fire, *Carefully*-** Fires in fire-suppressed stands can be extremely dangerous and counterproductive. First, opting for a series of cool winter burns can accomplish most of the goals accomplished by using summer fires. Only after litter layers are under control do managers need to apply spring and summer fires. Second, reliance upon anything other than an experienced fire manager is dangerous. Finally, as has been emphasized, mop up with heavy amounts of water is critical.

5. **Watch Non-Natives-** Non-native species (kudzu, privet, Chinese tallow, mimosa, and others) can quickly invade and alter the disturbed sites that are often created during restoration activities. Overlooking or downplaying their presence ***will be*** expensive and time consuming.

CONCLUSIONS

Build It, and They Will Come! By restoring the functional and structural integrity to degraded ecosystems, associated components will return. With just one fire in the Flomaton Natural Area, many birds, forbs, grasses, and herps that had been absent from the stand began their return. While snags, birds, herps, herbs, etc...receive little discussion here, from our experience, ***rebuild the ecosystem and they will come!***

LITERATURE CITED

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